Drug Enforcement Administration Laboratory System

DEA Laboratories

DEA Regional Laboratories

*Provide Enforcement Support*

- Evidence Analysis
  - Controlled Substances
  - Latent Prints
  - Digital Evidence
- Court Testimony
- Clandestine Drug Laboratory Seizures
- Trace Drug Evidence Collection
Special Testing and Research Laboratory

- Intelligence Oriented
- Overseas Support
  - Analysis
  - Field Work
- Training
  - Domestic
  - Foreign
- Research/Special Projects
- Publications and Reviews
- Unknowns/New Drugs
- Instrument Evaluations
- Reference Standards Program
- Methods Development

Special Programs

Strategic and Tactical Intelligence Support

- Cocaine Signature
- Heroin Signature
  - Heroin Domestic Monitor
- Methamphetamine Profiling
Cocaine Signature Program

**Mission**
- Origin Determination by Chemical Analyses

**Laboratory’s Customers**
- DEA’s Intelligence Division
- United States Drug Policymakers

**History**
- Initiated in 1997

**Authentic Samples**
- From cocaine producing regions
  - Leaf
  - Cocaine Processing Laboratory Samples
Cocaine Signature Program

Signatures – Origin of Base
• Colombia
• Peru
• Bolivia

Processing Methodology For Base to HCl
• Colombia
• Peru
• Bolivia

Sample Origins
• All International Offices
• Port of Entry Seizures
• DEA Field Laboratories
• Miscellaneous
Cocaine Signature Program

Determining the Origin of Cocaine Base

Four Methods Utilized

• CISPA – Multiple trace alkaloids including
tropacocaine and trimethoxy alkaloids
  Oxidation / Hydrolysis / Diluents / Base Origin

• Cinnamoyls – Cinnamoyl cocaine alkaloids
  Oxidation / Base Origin

• Trux – Truxilline alkaloids
  Base Origin / Leaf Variety

• IRMS – Isotopes of carbon and nitrogen
  13C to 12C and 15N to 14N – Leaf Variety

Cocaine Signature Program

Determining the HCl Processing Method

Static Headspace GC/MS

Quantifies Occluded Solvents Trapped in Crystalline Matrix of Powder

Determines

• Solvent used to dissolve cocaine base
• Solvent used for HCl conversion
  • Concentrated HCl or alcoholic HCl
Cocaine Signature Program
Reporting Results

Heroin Signature Program

Mission
• Origin Determination by Chemical Analyses

Laboratory’s Customers
• DEA’s Intelligence Division
• United States Drug Policymakers
• Other Nations
Heroin Signature Program

• History
  • Initiated in 1977

• Authentic Samples
  • From heroin producing regions world-wide
  • Backbone is the authentic database

Heroin Signature Program

• Authentic Samples
  • All International Offices
  • Port of Entry Seizures
  • Regional DEA Laboratories

• Domestic Monitor Program
  • Retail Level Heroin Purchases
  • Intelligence Program: 28 Cities
Heroin Signature Program

**Classifications**

- Southeast Asian
  - SEA/2
  - SEA/4
- Southwest Asian
  - SWA/A
  - SWA/B
  - SWA/C
- South American - SA
- Mexican - MEX

**Regional processes**

1. **Collection of the Opium Gum/Latex**
2. **Extraction of Morphine from Opium**
3. **Production of Heroin Base**
4. **Production of Heroin Hydrochloride**

**Basis for classification of samples**
Heroin Signature I: Capillary Electrophoresis

Clandestine extraction of morphine from opium - never complete or consistent

Opium alkaloids and by-products remain in the final heroin product

UV 205 nm

UV 195 nm

UV 152 nm

(a) thiamine  (b) quinine  (c) heroin  (d) O6-monoacetylmorphine  (e) O3-monoacetylmorphine  (f) morphine

(g) acetylcodaine  (h) papaverine  (i) codeine  (j) noscapine  (k) procaine  (l) diphenhydramine

Heroin Signature II: Quantitation Results

44 – 48 acidic and neutral impurities
Heroin Occluded Solvent Analysis: GC/MS

Heroin Base to Heroin HCl Conversion

*Organic Solvents Become Trapped in the Crystalline Matrix*

Heroin Signature Program Reporting

*From Lab*  
*From Intelligence Division*
Methamphetamine Profiling Program

Mission
• Determine Synthetic Routes
• Monitor Precursor Chemicals
• Monitor Reagents and Solvents
• Track Manufacturing Trends

Synthetic vs. Natural Product

Methamphetamine Profiling Program

History
1997 – Started Developing Procedures
Late 1998 – Began Running Samples
• Data Collection
2000 – Inaugural Report
2003 – Formalized Program
Methamphetamine Profiling Program

Laboratory’s Customers
DEA’s Special Agents
DEA’s Intelligence Division
United States Drug Policymakers

Authentic Samples/Sample Origins
• DEA Field Laboratories
• International DEA Offices
• State and Local Police
• Clandestine Laboratories
Methamphetamine Profiling Program

Analytical Methods

- NMR – Qualitative and quantitative analyses
- Capillary Electrophoresis – Isomer determination
- GC/MS – Organic impurity determination
- LC/Fluorescence – Trace naphthalene compounds
- FTIR – Qualitative analysis
- ICPMS – Trace metals analysis

\[ \text{Ephedrine} \rightarrow \text{Iodomethamphetamine} \rightarrow \text{Methamphetamine} \]

Methamphetamine Profiling Program

Reporting Results

- Average Purity
  - Regional
  - National
- Isomer Determination
- Synthetic Routes
- Adulterants/Diluents
- Trends
- Special Features
Strategic Intelligence Value of Signature/Profiling Programs

DEA Signature and Profiling Programs:
- Heroin Signature Program (HSP)
- Cocaine Signature Program (CSP)
- Methamphetamine Profiling Program (MPP)

These programs are of intelligence value since they identify:
- Changes in the source of origin of seized cocaine and heroin
- Trafficking routes and methods for various drug types
- The use of new processing methods and/or precursor chemicals
- Changes in drug purity
- The presence of adulterants and diluents

Thank You for Your Attention

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